General

Title

Thoracic surgery: lobectomy for lung cancer composite score.

Source(s)

Society of Thoracic Surgeons (STS). General thoracic surgery database: NQMC measure submission. Chicago (IL): Society of Thoracic Surgeons (STS); 2016 Dec. 31 p.

Measure Domain

Primary Measure Domain

Clinical Quality Measures: Outcome

Secondary Measure Domain

Does not apply to this measure

Brief Abstract

Description

The Society of Thoracic Surgeons (STS) lobectomy for lung cancer composite score measures surgical performance for elective lobectomy in patients with lung cancer. To assess overall quality, the composite comprises the following two domains:

> *Domain 1 – Operative Mortality*: Operative mortality is defined as death before hospital discharge or within 30 days of the operation.
> *Domain 2 – Major Complications*: Major complications are defined as one or more of the following: pneumonia, acute respiratory distress syndrome, bronchopleural fistula, pulmonary embolus, initial ventilator support greater than 48 hours, reintubation/respiratory failure, tracheostomy, myocardial infarction, or unexpected return to the operating room.

Participants receive a score for each of the two domains, plus an overall composite score. The composite score was calculated as a weighted sum of (1 minus the risk-standardized mortality rate) and (1 minus the risk-standardized morbidity rate). Mortality and morbidity were weighed inversely by their respective standard deviations across participants. This procedure is equivalent to first re-scaling mortality and complications by their respective standard deviations and then assigning equal weighting to the re-scaled

mortality rate and rescaled complication rate. Based on standard deviations derived from the data, the final composite measure was defined as 0.81 x risk-standardized mortality rate + 0.19 x risk-standardized complication rate.

Outcome data are collected on all patients and from all participants. For optimal measure reliability, participants meeting a volume threshold of at least 30 cases over 3 years receive a score for each of the two domains, plus an overall composite score. The overall composite score is created by "rolling up" the domain scores into a single number. In addition to receiving a numeric score, participants are assigned to rating categories designated by the following:

1 star – lower-than-expected performance
2 stars – as-expected performance
3 stars – higher-than-expected performance

Rationale

The Society of Thoracic Surgeons (STS) General Thoracic Surgery Database (GTSD) has risk adjustment models for morbidity and mortality following lung cancer resection and prolonged length of stay following lobectomy. Because lobectomy for cancer is the most commonly performed major general thoracic surgical procedure in the GTSD, an expert panel of general thoracic surgeons selected lobectomy for its first thoracic quality measure. The lobectomy composite was designed as a twoâ€domain measure including risk-adjusted mortality and major complications. This methodology mirrors the development of several STS adult cardiac surgery composite measures. The lobectomy for lung cancer composite measure adds considerable value to the GTSD, as it is used for quality assessment, provider feedback, and performance improvement.

Evidence for Rationale

Society of Thoracic Surgeons (STS). General thoracic surgery database: NQMC measure submission. Chicago (IL): Society of Thoracic Surgeons (STS); 2016 Dec. 31 p.

Primary Health Components

Thoracic surgery; lung cancer; lobectomy; operative mortality; major complications; pneumonia; acute respiratory distress syndrome; bronchopleural fistula; pulmonary embolus; initial ventilator support greater than 48 hours; reintubation; respiratory failure; tracheostomy; myocardial infarction; unexpected return to the operating room

Denominator Description

Elective lobectomies in patients with lung cancer (see the related "Denominator Inclusions/Exclusions" field)

Numerator Description

The composite comprises the following two domains:

Domain 1 – Operative Mortality: Operative mortality is defined as death before hospital discharge or within 30 days of the operation.
Domain 2 – Major Complications: Major complications are defined as one or more of the following: pneumonia, acute respiratory distress syndrome, bronchopleural fistula, pulmonary embolus, initial ventilator support greater than 48 hours, reintubation/respiratory failure, tracheostomy, myocardial

infarction, or unexpected return to the operating room.

See the related "Numerator Inclusions/Exclusions" field.

Evidence Supporting the Measure

Type of Evidence Supporting the Criterion of Quality for the Measure

A formal consensus procedure, involving experts in relevant clinical, methodological, public health and organizational sciences

One or more research studies published in a National Library of Medicine (NLM) indexed, peer-reviewed journal

Additional Information Supporting Need for the Measure

Unspecified

Extent of Measure Testing

General Thoracic Surgery Database (GTSD) participating sites are randomly selected for participation in the Society of Thoracic Surgeons (STS) GTSD Audit, which is designed to evaluate the accuracy, consistency, and comprehensiveness of data collection and ultimately validate the integrity of the data contained in the database. Telligen, formerly the Iowa Foundation for Medical Care, has conducted audits on behalf of STS since 2006. In 2015, ten percent of randomly selected STS GTSD participants (N = 25, an increase from 24 in 2014 and 18 in 2013) were audited. The audit process involves reâ€abstraction of data for 20 cases records (at least 15 lobectomy and up to 5 esophagectomy) and comparison of 40 STS GTSD V2.2 individual data elements with those submitted to the data warehouse. Agreement rates are calculated for each variable, each variable category and overall. In 2015, the overall aggregate agreement rate was 97.02%, demonstrating that the data contained in the STS GTSD are both comprehensive and highly accurate.

Data Analysis

Aggregate agreement rates were computed for all facilities by calculation of the sum of all facilities' numerators divided by the sum of all facilities' denominators, for each individual variable, each variable category and overall.

Chi-square statistics were calculated to identify any possible relationships between the data collection process variables and agreement rates. Tests where the chi-square statistic had a probability of less than 5% (p less than 0.05) were considered to show statistically significant differences in agreement rate between the levels of the process measure.

Agreement Rate Results

Database validity was evaluated by re-abstraction of defined variables from the medical records and comparison to submitted data. Agreement rates were calculated at the individual variable level, category level and overall. Aggregate agreement rates are presented in the table in the original measure documentation. There were 14,854 total variables abstracted and of those 14,412 variables matched, resulting in an overall agreement rate of 97.02%.

Process Variable Correlation Tables

The relationships between process variables and overall agreement rates were examined and included:

Facility data collection performed from electronic medical records or a combination of paper and electronic medical records and overall agreement rate
Facility data collection method (concurrent/retrospective/both) and overall agreement rate
Data collection performed by a single abstractor or multiple staff and overall agreement rate
Attendance at the annual data managers' meeting, STS Advances in Quality and Outcomes (AQO) Conference, and overall agreement rate
Agreed upon abstraction location for data elements documented in multiple locations and overall agreement rate

Relationship between Data Collection Source & Agreement Rate

Facilities using an electronic health record (EHR) for data collection had higher agreement rates, 97.36%, than those facilities using both paper medical records and an EHR, 96.31%. There were no facilities that used paper medical records alone (p less than 0.0004).

Relationship between Data Collection Method & Agreement Rate

Facilities collecting data retrospectively have higher agreement rates, 97.55%, than those facilities collecting data concurrently, 96.18%, or both, 96.38% (p equal to or less than 0.0001).

Relationship between Data Collection Performed by a Single Abstractor or Multiple Staff & Agreement Rate

Facilities with a single individual performing data abstraction have higher agreement rates, 98.02%, than those facilities that have multiple individuals performing data abstraction, 96.24% (p less than 0.0001).

Relationship between Attendance at AQO Conference & Agreement Rate

Facilities having staff attend the annual AQO Conference have higher agreement rates, 97.25%, than those that do not have staff attend, 96.11% (p less than 0.0012).

Relationship between Have an Agreed Upon Location & Agreement Rate

Facilities that utilize an agreed upon location for data elements recorded in multiple locations have higher agreement rates, 97.31%, than facilities that do not utilize an agreed upon location, 93.61% (p less than 0.0001).

In addition, validity is regularly assessed by an expert panel of general thoracic surgeons assembled by the STS General Thoracic Surgery Database Task Force, the STS Quality Measurement Task Force, and the STS Task Force on Quality Initiatives, all of which report to the STS Workforce on National Databases.

The STS Composite Score for Rating Program Performance for Lobectomy for Lung Cancer

Results

Table 4 of the original measure documentation (Kozower et al., 2016) illustrates the reliability for the lobectomy star ratings based on volume thresholds. Using the threshold volume of performing 30 lobectomies over the 3-year study period, the reliability of the STS lobectomy composite measure was 0.56 (95% Bayesian credible interval [CrI]: 0.45 to 0.66), similar to the reliability of the STS aortic valve replacement (AVR) plus coronary artery bypass grafting (CABG) measure, which was 0.51 (95% CrI: 0.46 to 0.55) (Shahian et al., 2014). Therefore, only programs performing a minimum of 30 lobectomies for lung cancer will be eligible for a star rating as there is insufficient information about the 25% of programs performing fewer than 10 lobectomies per year to provide them with a reliable star rating.

Table 5 of the original measure documentation (Kozower et al., 2016) shows the number of STS participants classified as high- (three-star), average- (two-star), or low- (one-star) performing centers using 80%, 90%, 95%, and 98% Bayesian CrI. Although there is no clear statistical criterion on which to base the choice of the most appropriate CrI, from a practical perspective the measure developers believe that 98% CrI provided higher specificity but inadequate differentiation among programs. Conversely, although the percentage of high- and low-performing programs was substantially larger with 80% CrI,

there was insufficient certainty about the participant's classification to assure face validity. Based on these practical considerations and what the STS has done previously for their quality measures, the developers chose 95% CrI (corresponding to 97.5% Bayesian probability). This yielded 4.7% one-star programs (8 of 172) and 7.0% three-star programs (12 of 172), or nearly 11% overall high-performing or low-performing centers. This seemed an appropriate compromise between providing acceptable probability of accurate classification along with reasonable discrimination among programs. Table 6 of the original measure documentation (Kozower et al., 2016) demonstrates construct validity of the star ratings as the mortality and major complication rates decrease monotonically from one-star (below average) to three-star (above average) participants.

For more information, refer to *The Society of Thoracic Surgeons Composite Score for Rating Program Performance for Lobectomy for Lung Cancer* (see the "Companion Documents" field).

Evidence for Extent of Measure Testing

Kozower BD, O'Brien SM, Kosinski AS, Magee MJ, Dokholyan R, Jacobs JP, Shahian DM, Wright CD, Fernandez FG. The Society of Thoracic Surgeons composite score for rating program performance for lobectomy for lung cancer. Ann Thorac Surg. 2016 Apr;101(4):1379-86; discussion 1386-7. [23 references] PubMed

Shahian DM, He X, Jacobs JP, Rankin JS, Welke KF, Edwards FH, Filardo G, Fazzalari FL, Furnary A, Kurlansky PA, Brennan JM, Badhwar V, O'Brien SM. The STS AVR+CABG composite score: a report of the STS Quality Measurement Task Force. Ann Thorac Surg. 2014 May;97(5):1604-9. PubMed

Society of Thoracic Surgeons (STS). General thoracic surgery database: NQMC measure submission. Chicago (IL): Society of Thoracic Surgeons (STS); 2016 Dec. 31 p.

State of Use of the Measure

State of Use

Current routine use

Current Use

not defined yet

Application of the Measure in its Current Use

Measurement Setting

Hospital Inpatient

Professionals Involved in Delivery of Health Services

not defined yet

Least Aggregated Level of Services Delivery Addressed

Clinical Practice or Public Health Sites

Statement of Acceptable Minimum Sample Size

Specified

Target Population Age

Age greater than or equal to 18 years

Target Population Gender

Either male or female

National Strategy for Quality Improvement in Health Care

National Quality Strategy Aim

Better Care

National Quality Strategy Priority

Making Care Safer
Prevention and Treatment of Leading Causes of Mortality

Institute of Medicine (IOM) National Health Care Quality Report Categories

IOM Care Need

Living with Illness

IOM Domain

Effectiveness

Safety

Data Collection for the Measure

Case Finding Period

3 years

Denominator Sampling Frame

Patients associated with provider

Denominator (Index) Event or Characteristic

Clinical Condition

Institutionalization

Therapeutic Intervention

Denominator Time Window

not defined yet

Denominator Inclusions/Exclusions

Inclusions
Elective lobectomies in patients with lung cancer

Lobectomy Population

Lung cancer (LungCancer – Society of Thoracic Surgeons [STS] General Thoracic Surgery Database [GTSD] sequence number 830) is marked "yes" and category of disease – primary (CategoryPrim – STS GTSD sequence number 1300) is marked as one of the following (International Classification of Diseases, Ninth Revision [ICD-9], International Classification of Diseases, Tenth Revision [ICD-10]):

- Lung cancer, upper lobe (162.3, C34.10)
- Lung cancer, middle lobe (162.4, C34.2)
- Lung cancer, lower lobe (162.5, C34.30)
- Lung cancer, location unspecified (162.9, C34.90)

Primary procedure is one of the specific Current Procedural Terminology [CPT] codes for lobectomy (refer to the original measure documentation for specific CPT codes)
Status of operation (Status – STS GTSD sequence number 1420) is marked as "elective"
American Society of Anesthesiologists (ASA) classification (ASA – STS GTSD sequence number 1470) is marked I, II, III, IV, or V
Lung tumor (PathStageLungT – STS GTSD sequence number 1540) is marked T1a, T1b, T2a, T2b, T3, or T4
Gender (Gender – STS GTSD sequence number 190) is marked "male" or "female," age (Age – STS GTSD sequence number 170) is completed, and discharge status (MtDCStat – STS GTSD sequence number 2200) is marked as "alive" or "dead"
Only analyze first operation of hospitalization meeting criteria 1 to 6

Exclusions
Unspecified

Exclusions/Exceptions

not defined yet

Numerator Inclusions/Exclusions

Inclusions

The composite comprises the following two domains:

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Coding

Operative Mortality: One of the following fields is marked "dead":

Discharge status (MtDCStat – Society of Thoracic Surgeons [STS] General Thoracic Surgery Database [GTSD] sequence number 2200)
Status at 30 days after surgery (Mt30Stat – STS GTSD sequence number 2240)

Complications: Postoperative events (POEvents – STS GTSD sequence number 1710) is marked "yes" and one of the following items is marked "yes":

Reintubation (Reintube – STS GTSD v 2.2, sequence number 1850)/respiratory failure (RespFail – STS GTSD sequence number 1800)
Need for tracheostomy (Trach – STS GTSD sequence number 1860)
Initial ventilator support greater than 48 hours (Vent – STS GTSD sequence number 1840)
Acute respiratory distress syndrome (ARDS – STS GTSD sequence number 1790)
Pneumonia (Pneumonia – STS GTSD sequence number 1780)
Pulmonary embolus (PE – STS GTSD sequence number 1820)
Bronchopleural fistula (Bronchopleural – STS GTSD sequence number 1810)
Myocardial infarction (MI – STS GTSD sequence number 1900)
or

Unexpected return to the operating room (OR) (ReturnOR – STS GTSD sequence number 1720) is marked "yes" and primary reason for return to OR (ReturnORRsn – STS GTSD sequence number 1730) is marked "bleeding"

Note: The composite score was calculated as a weighted sum of (1 minus the risk-standardized mortality rate) and (1 minus the risk-standardized morbidity rate).

Exclusions
Unspecified

Numerator Search Strategy

Institutionalization

Data Source

Administrative clinical data

Electronic health/medical record

Paper medical record

Registry data

Type of Health State

Adverse Health State

Instruments Used and/or Associated with the Measure

The Society of Thoracic Surgeons General Thoracic Surgery Database (GTSD) Major Procedure Data Collection Form Version 2.3

Computation of the Measure

Measure Specifies Disaggregation

Measure is disaggregated into categories based on different definitions of the denominator and/or numerator

Basis for Disaggregation

The Society of Thoracic Surgeons (STS) lobectomy for lung cancer composite score measures surgical performance for elective lobectomy in patients with lung cancer. To assess overall quality, the composite comprises the following two domains:

> *Domain 1 – Operative Mortality*: Operative mortality is defined as death before hospital discharge or within 30 days of the operation.
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Participants receive a score for each of the two domains, plus an overall composite score.

Scoring

Composite/Scale

Rate/Proportion

Weighted Score

Interpretation of Score

Desired value is a higher score

Allowance for Patient or Population Factors

not defined yet

Description of Allowance for Patient or Population Factors

The Society of Thoracic Surgeons (STS) lobectomy composite score is a combination of two risk-adjusted outcome metrics: operative mortality and major complications. Participant-specific risk-adjusted rates of these endpoints were estimated in a Bayesian hierarchical model, as detailed in the appendix of *The*

Society of Thoracic Surgeons Composite Score for Rating Program Performance for Lobectomy for Lung Cancer. Covariates in this model were taken from the previous lung cancer resection model: age, sex, year of operation, body mass index, hypertension, steroid therapy, congestive heart failure, coronary artery disease, peripheral vascular disease, reoperation, preoperative chemotherapy within 6 months, cerebrovascular disease, diabetes mellitus, renal failure, dialysis, past smoker, current smoker, forced expiratory volume in 1 second percent of predicted, Zubrod score (linear plus quadratic), American Society of Anesthesiologists class (linear plus quadratic), and pathologic stage as defined by the American Joint Committee on Cancer cancer staging manual, 6th edition.

For more information, refer to *The Society of Thoracic Surgeons Composite Score for Rating Program Performance for Lobectomy for Lung Cancer* (see the "Companion Documents" field).

Standard of Comparison

not defined yet

Identifying Information

Original Title

Society of Thoracic Surgeons (STS) lobectomy for lung cancer composite score.

Measure Collection Name

General Thoracic Surgery Measures

Submitter

Society of Thoracic Surgeons - Medical Specialty Society

Developer

Society of Thoracic Surgeons - Medical Specialty Society

Funding Source(s)

Unspecified

Composition of the Group that Developed the Measure

The Society of Thoracic Surgeons (STS) General Thoracic Surgery Database Task Force. Please contact STS for list of members.

Financial Disclosures/Other Potential Conflicts of Interest

Unspecified

Adaptation

This measure was not adapted from another source.

Date of Most Current Version in NQMC

2016 Dec

Measure Maintenance

Unspecified

Date of Next Anticipated Revision

Unspecified

Measure Status

This is the current release of the measure.

Measure Availability

Source not available electronically.

For more information, contact the Society of Thoracic Surgeons (STS) at 633 N. Saint Clair Street, Floor 23, Chicago, IL 60611; Phone: 312-202-5800; Fax: 312-202-5801; Web site: http://www.sts.org .

Companion Documents

This following is available:

Kozower BD, O'Brien SM, Kosinski AS, Magee MJ, Dokholyan R, Jacobs JP, Shahian DM, Wright CD, Fernandez FG. The Society of Thoracic Surgeons composite score for rating program performance for lobectomy for lung cancer. Ann Thorac Surg. 2016 Apr;101(4):1379-86; discussion 1386-7. Available from the Annals of Thoracic Surgery Web site .

NQMC Status

This NQMC summary was completed by ECRI Institute on January 9, 2017. The information was verified by the measure developer on February 7, 2017.

Copyright Statement

Production

Source(s)

Society of Thoracic Surgeons (STS). General thoracic surgery database: NQMC measure submission. Chicago (IL): Society of Thoracic Surgeons (STS); 2016 Dec. 31 p.

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